UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

October 26, 2010

The Honorable Gregory B. Jaczko
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL APPLICATION FOR THE COOPER NUCLEAR STATION

During the 576th meeting of the Advisory Committee on Reactor Safeguards, October 7-9, 2010, we completed our review of the license renewal application for the Cooper Nuclear Station (CNS) and the final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during its meeting on May 5, 2010. During these reviews, we had the benefit of discussions with representatives of the NRC staff and the applicant, Nebraska Public Power District (NPPD). We also had the benefit of the documents referenced. This report fulfills the requirement of 10 CFR 54.25 that the ACRS review and report on all license renewal applications.

CONCLUSION AND RECOMMENDATION

1. The programs established and committed to by the applicant to manage age-related degradation provide reasonable assurance that CNS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public.

2. The application for renewal of the operating license of CNS should be approved.

BACKGROUND AND DISCUSSION

Cooper Nuclear Station is a General Electric boiling water reactor (BWR-4) with a Mark I pressure suppression containment design. The current power rating of 2419 MWt includes a 1.6 percent power uprate that was implemented in 2008. In September 2008, Nebraska Public Power District (NPPD) requested renewal of the CNS operating license for 20 years beyond the current license term, which expires on January 18, 2014.

In the final SER, the staff documented its review of the license renewal application and other information submitted by the applicant or obtained during three staff audits and two inspections conducted at the plant site. The staff reviewed the completeness of the applicant's identification of structures, systems, and components (SSCs) that are within the scope of license renewal; the integrated plant assessment process; the applicant's identification of the plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's Aging Management Programs (AMPs); and the identification and assessment of time-limited aging analyses (TLAAs) requiring review.

The applicant identified the SSCs that fall within the scope of license renewal and performed an aging management review for these SSCs. The applicant will implement 40 AMPs for license renewal. These include 29 existing programs and 11 new programs. A total of 24 AMPs, ten of which contain enhancements, are consistent with the guidance in the Generic Aging Lessons Learned (GALL) Report. Twelve AMPs contain one or more exceptions to approaches specified in the GALL Report. Four plant-specific programs manage issues that are either not addressed or are not consistent with guidance in the GALL Report. These include three existing programs for periodic surveillance and preventive maintenance, auxiliary systems water chemistry control, and monitoring of the spent fuel rack neutron absorption panels; and one new program for inspection of bolted electrical cable connections. We reviewed the plant-specific programs and the AMP exceptions to the GALL Report, and we agree with the staff that they are acceptable.

The applicant identified the systems and components requiring TLAAs and reevaluated them for the period of extended operation. The staff concluded that the applicant has provided an acceptable list of TLAAs, as defined in 10 CFR 54.3. Furthermore, the staff concluded that in all cases the applicant has met the requirements of the License Renewal Rule by demonstrating that the TLAAs will remain valid for the period of extended operation, or the TLAAs have been projected to the end of the period of extended operation, or the aging effects will be adequately managed for the period of extended operation. We concur with the staff's conclusion that the TLAAs have been properly identified and that the required criteria will be met for the period of extended operation.

The staff conducted three license renewal audits and two inspections at the CNS site. The audits verified the appropriateness of the aging management review, scoping and screening methodology, and associated AMPs. The inspections examined the scoping and screening of nonsafety-related SSCs and verified the adequacy of the guidance, documentation, and implementation of selected AMPs. The audit and inspection teams also performed independent examinations of CNS condition reports to confirm that plant-specific operating experience has been adequately addressed during the AMP development and implementation processes. Based on the audits and inspections, the staff concluded in the final SER that the proposed activities will adequately manage the aging of SSCs identified in the application and that the intended functions of these SSCs will be maintained during the period of extended operation. We agree with this conclusion.

The staff has identified industry operating experience which indicates that power cables with operating voltages of 480V to 2kV may be susceptible to failure if they are exposed to significant moisture. These voltages are considerably lower than the 2kV to 35kV range that is traditionally designated as "medium voltage." CNS has not experienced any moisture-related failures of in-scope lower voltage cables. In response to the staff's concerns, the applicant expanded the scope of the Non-EQ Inaccessible Medium Voltage Cable Program to include cables with voltages of 480V and above. It is expected that this expanded scope of cable monitoring will be included in all future license renewals.

The staff has concluded that external visual inspections do not provide adequate assurance that cracking is not present at the internal radius of socket welds in small bore piping systems. There are currently no approved industry standard methods or qualified techniques to perform volumetric examinations of these welds. The CNS operating experience indicates that vibration-induced cracking has occurred in three Class 1 and one Class 2 small bore socket welds.

Destructive examinations of 12 similarly susceptible welds did not identify any additional cracking or other aging mechanisms. In addition to visual inspections, the applicant will perform volumetric examinations of at least three Class 1 socket welds during each inservice inspection interval for the period of extended operation. We concur with the staff's conclusion that this program, which accounts for the CNS plant-specific operating experience, will adequately monitor and manage the effects of aging in these welds.

All in-scope underground piping at CNS is buried and is in direct contact with soil. The CNS operating experience does not contain evidence of unexpected corrosion or accelerated aging of buried tanks or piping systems. The applicant will upgrade cathodic protection systems to meet current standards and to ensure at least 90 percent operating availability.

The Buried Piping and Tanks Inspection Program will contain guidance and methods from current industry initiatives for the management of buried piping integrity. CNS inspection priorities will be derived from a composite corrosion risk ranking process that accounts for the safety significance, corrosion susceptibility, and radioactive fluid content of each in-scope piping system. Prior to the period of extended operation, the applicant will inspect high-risk buried tanks and two excavated sections of piping in each of the service water, fire protection, and condensate makeup systems. Additional inspections will be performed for diesel generator fuel oil, high pressure coolant injection, standby gas treatment, and plant drains piping. During each subsequent 10-year interval, the applicant will inspect all high-risk tanks and at least 2 percent of the total linear feet of high-risk buried piping. Inspection techniques will include visual examinations, ultrasonic testing, and guided wave ultrasonic or other advanced methods. The staff concluded that the proposed program will adequately monitor and manage the aging of buried piping and tanks. We agree with this conclusion.

The fatigue analyses that are documented in the license renewal application indicate that the 60-year projected environmentally adjusted Cumulative Usage Factors (CUFs) for the reactor vessel feedwater nozzles and the residual heat removal return line transition piping may substantially exceed 1.0 prior to the end of the period of extended operation. The projected CUF for the reactor vessel core spray nozzle may slightly exceed 1.0. The applicant will enhance the fatigue monitoring program for these locations and will either (1) refine the fatigue analyses using NRC-approved methods to determine valid CUFs that are less than 1.0 when accounting for the effects of the reactor water environment, or (2) repair or replace the affected locations before exceeding a CUF of 1.0. Updated evaluations of the reactor coolant environmental correction factor for the fatigue life of Alloy 600 components will be based on the data and information in NUREG/CR-6909. We agree that these enhancements will adequately manage or mitigate the effects from fatigue-related aging at these locations.

Extensive pitting corrosion has occurred throughout the wetted area of the CNS torus. This corrosion has been attributed to degradation of the zinc coating, exacerbated by the deposition of corrosion particles and sludge from the interconnected piping systems. Approximately 3800 indications have been documented since 1991, covering approximately 1.1 percent of the surface area below the water line. Of these, 2090 have been discovered since 2001. Torus inspections are currently performed during every other refueling outage, at 3-year intervals. Individual pitting sites have been recoated with an epoxy sealant. The rate of corrosion in unsealed pits has been monitored by measurements at fixed inspection grids. The maximum measured pit depth at the 2008 inspection interval was 0.092 inch, or approximately 13 percent of the nominal torus shell thickness at the incident location. Evaluations have confirmed that the

current torus conditions remain acceptable in accordance with the criteria in ASME Section IWE-3511.3. Projections of the maximum observed rate of unmitigated corrosion indicate that adequate torus design margin will be maintained through at least 2020. Therefore, the pitting is not a current licensing issue.

The current torus inspection and monitoring program, with local sealing of the identified pits, does not address the continuing degradation of the zinc coating or the emergence of new pitting sites. The applicant will implement the following changes to address this issue: (1) the entire wetted surface of the torus, including all underwater piping and structures, will be recoated with an approved sealant within three years after entering the period of extended operation; (2) inspections and sludge removal will be performed every refueling outage until the torus is recoated; and (3) analyses will be performed after each inspection to confirm that acceptable wall thickness will be maintained until the torus is recoated. The applicant has indicated that they plan to change from an 18-month fuel cycle to a 24-month fuel cycle in 2012. Therefore, inspections will be performed at 2-year intervals through approximately 2016, rather than the former 3-year interval. Based on the type of pitting corrosion, the documented corrosion rates, the enhanced inspection program, and the commitment to recoat the entire wetted surface of the torus, we concur that the proposed programs provide assurance that adequate margins for torus integrity will be maintained through the period of extended operation.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating license for CNS. The programs established and committed to by NPPD provide reasonable assurance that CNS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The NPPD application for renewal of the operating license for CNS should be approved.

Sincerely,

/RA/

Said Abdel-Khalik
Chairman

References:

1. Letter to Mr. Brian O'Grady, transmitting, "NUREG-1944, Safety Evaluation Report Related to the License Renewal of Cooper Nuclear Station," 09/01/2010 (ML102000270)

2. Letter to U.S. Nuclear Regulatory Commission, transmitting, "License Renewal Application, Cooper Nuclear Station, Docket No. 50-298, DPR-46," 09/27/2008 (ML083030225)

3. Letter to Mr. Stewart B. Minahan, transmitting "Audit Report Regarding the Cooper Nuclear Station License Renewal Application (TAC No. MD9763)," 06/15/2009 (ML091380365)

4. Letter to Nebraska Public Power District, transmitting, “Summary of Regulatory Audit Related to the Review of the License Renewal Application for Cooper Nuclear Station (TAC NO. MD9763),” 07/01/2009 (ML091750368)

5. Letter to Mr. Stewart B. Minahan, transmitting, “Cooper Nuclear Station - NRC License Renewal Inspection Report 05000298/2009010,” 11/24/2009 (ML093290251)

of the nominal torus shell thickness at the incident location. Evaluations have confirmed that the current torus conditions remain acceptable in accordance with the criteria in ASME Section IWE-3511.3. Projections of the maximum observed rate of unmitigated corrosion indicate that adequate torus design margin will be maintained through at least 2020. Therefore, the pitting is not a current licensing issue.

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Accession No: ML102850368 **Publicly Available (Y/N):** Y **Sensitive (Y/N):** N
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